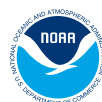# Pacific Islands Geographic Information System Working Project Plan

September 2001

NOAA Coastal Services Center
LINKING PEOPLE, INFORMATION, AND TECHNOLOGY

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Introduction

The following document details the plan for a collaborative, multi-agency project to increase spatial data use and capacity—including the use of geographic information systems and the Global Positioning System—within the coastal zone management agencies of the State of Hawaii, the Territories of American Samoa and Guam, and the Commonwealth of the Northern Mariana Islands (CNMI). The project is being led by the National Oceanic and Atmospheric Administration's (NOAA) Coastal Services Center. Other primary NOAA partners currently include the Pacific Services Center (PSC), the National Geodetic Survey (NGS), and the Office of Ocean and Coastal Resource Management (OCRM). The Island partners include Hawaii's Coastal Zone Management Program and Department of Land and Natural Resources' Division of Aquatic Resources; the Guam Coastal Management Program; the American Samoa Coastal Management Program; and CNMI's Coastal Resources Management program.

Executive Summary

Unknown to most Americans are the small but strategic territories and political entities in the Pacific Ocean that are under the jurisdiction of the United States. For most U.S. citizens, geographic knowledge of their country ends at California, and the westernmost states of Hawaii and Alaska are seen only as floating insets in the margins of the map. However, the U.S. does have a strategic presence in the Pacific with the insular areas of American Samoa, Guam, and CNMI. These islands, in conjunction with the State of Hawaii, comprise a wealth of diverse ecological, cultural, and strategic resources.

Like their island cousins of Puerto Rico and the U.S. Virgin Islands in the Atlantic, the Pacific Islands (minus Hawaii) share a multitude of regulations and institutional arrangements to incorporate local, native, and traditional governments, with which most U.S. states are unfamiliar. The Pacific Island territories and the state of Hawaii participate in the Coastal Zone Management Program, which was developed under the Coastal Zone Management Act (CZMA) of 1972 (16 U.S.C. 1451-1464). CZMA establishes a national policy "to preserve, protect, develop, and where possible, to restore or enhance, the resources of the Nation's coastal zone for this and succeeding generations." It provides federal funds and outlines general guidelines for development and administration of the program. Participation is voluntary, and states or territories are given flexibility in how they deal with their particular issues. The islands are dealing with issues such as coastal hazards, public access, urban growth, wetland degradation, and habitat loss. A particularly important habitat issue is the degradation of coral reefs. Executive Order 13089 was issued on June 11, 1998, and deals specifically with the "preserva[tion] and protec[tion] of the biodiversity, health, heritage, and social and economic value of U.S. coral reef ecosystems and the marine environment." The majority of the U.S. coral reefs reside within the exclusive economic zone of the islands.

Management of these issues could be greatly enhanced through the increased use of geospatial technologies (e.g., geographic information systems and the Global Positioning System—GIS and GPS), access to well-documented geospatial data, and data sharing policies between partner agencies. This plan outlines the development of the Pacific Islands Geographic Information System (Islands GIS) project. The project will concentrate on data and infrastructure necessary to directly support the agencies and the other networked organizations charged with carrying out the CZMA. This project intends to assist in functions such as coordinating GIS, GPS, hardware, and software purchases; providing GIS, GPS, and metadata training; developing spatial data layers and associated metadata; creating and maintaining an informational Web site; maintaining an inter-island listserver to foster communication; and providing technical and personnel support to the Island region.

Why GIS?

Demands placed on coastal managers continue to grow while the resources available to do the job, especially the human resources, often lag behind. The application of spatial technologies is one means of narrowing this gap. The management of coastal areas is dependent on an understanding of the spatial distribution of the resources, activities, and conditions inside and often "upstream" of the coastal zone. Introduction of practical, easy-to-use GIS capabilities can greatly improve the ability of managers to understand these interrelationships and to manage them. The capability that GIS provides to analyze spatial relationships of features and activities can serve many purposes within the coastal programs. Creating a digital environment for storing, retrieving, and communicating information allows coastal program managers to describe their mission in a new and potentially more effective way. It also allows an organizational framework to capture and comprehend significant amounts of information about management areas under their jurisdiction.

Moreover, this project is expected to increase the rate of acceptance and use of spatial technologies in the Islands. The Center's research has demonstrated (1999 *Coastal Resource Management Customer Survey*) that coastal zone management (CZM) programs have lagged behind their land-based counterparts in the use of spatial technologies. The Islands have the added hurdle of distance that can greatly increase the time for integration of new technologies beneficial to programmatic goals. A fundamental objective of this project is to help overcome that time delay for the Pacific Island partners.

Project Goals and Performance Measures

The purpose of this project is one of capacity building and enhancement—to support Pacific Island CZM partners' programmatic goals through the development of operational and integrated spatial technology. Currently, the time frame is considered to be three to four years (subject to continued funding). Generally, with capacity-building efforts, the project life cycle is such that the first year is considered a planning year, the second and third years are implementation, and the final year is a reduced, maintenance effort.

In this project, the performance measures will include the following:
- the integration of a GIS assistant into the Islands' CZM staff to develop or assist with GIS projects;
- fully developed geodetic control network;
- the number of existing staff that are trained and using GIS toward programmatic goals;
- the successful procurement, installation, and integration of GIS hardware and software with existing CZM business systems;
- the number of useable coastal and ocean framework data layers and associated metadata;
- the number of appropriate spatial data applications that are used to support CZM activities;
- the mechanisms for long-term maintenance and technical support of GIS systems that have been developed by the CZM programs;
- the number of GIS sharing mechanisms that have been enhanced (e.g., memorandum of understanding, user's groups, listserver);
- the development of transition documents that will be available to document all aspects of the GIS for each Island entity to assist in GIS use and potential staff turnover.

Project Steps

The NOAA Coastal Services Center (the Center) will be coordinating the Islands GIS project activities over the next three to four years. The following broad project steps are briefly described below.

Conduct needs assessments of existing GIS capacity of Island CZM programs

As a first step to fully understanding GIS and related capacities and needs within each Island region program, a needs assessment and site visit was conducted for each island. The needs assessment collected information about the status of the Pacific Island coastal programs from a technological and resource-based perspective. The outcome of the assessments guided the development of appropriate and feasible tasks for the Islands GIS project as identified in this document. A combination of assessment methodologies (survey, document review, interviews, focus groups, and observations) were used to develop a complete picture of the coastal programs, priority issues, institutional arrangements, cultural framework, and technical, resource, and training needs.

Develop a mechanism to address shortages in staffing with capabilities in spatial technologies.

Staffing shortages in spatial technology areas faced by the Island CZM programs will be addressed by a multiple-step approach. A Pacific Islands Technical Assistantship program has been developed to place trained individuals in each island. Additional long-term technical staffing needs will be addressed on a case-by-case basis as the project progresses.

The Assistantship Program was designed to target newly graduated masters-level students who have experience living and working in other cultures, especially in island settings. The assistants also have expertise in both technology (GIS, GPS, etc.) and natural resource management. They will work to understand the individual programmatic needs, assist in developing suitable technological solutions, and pursue innovative methods to help other program staff understand and use the technology. They will also investigate potential linkages with other GIS users on the island, potentially set up GIS education mechanisms at local colleges, and work to fully integrate this effort within the islands' CZM program.

The assistant, in conjunction with the island host and the Center, will develop a plan for his or her two-year term. He or she will be expected to have one large term project (TBD) or several smaller term projects (approved) that demonstrate GIS functionality within the program. Additionally, an important component of each individual assistant's work will be the development of materials and transition documents that define all aspects of the GIS. The purpose of this documentation is to give existing and future staff a reference for the information system that includes information about hardware, software, training opportunities, maintenance contracts and contacts, data, metadata, applications, and links to other relevant reference material.

Each host island will provide one staff member who will serve as a mentor throughout the life of the project. The mentors are considered critical elements to the success of the project and important links with the NOS project team. Ideally, the mentor will have experience in the use of spatial technologies within the CZM program. The mentor is expected to guide the assistant on project-specific issues as well help assistants develop professional and long-term goals. Most importantly, the mentor must help integrate the assistant into the daily life of the coastal agency and ensure that they have the resources, training, and support needed to complete the project successfully.

Coordinate with the National Geodetic Survey to investigate datum issues and inform Island partners through training or workshops.

Geodetic control data are the fundamental layer that must underlie all other spatial data for an accurate GIS. Data transformation mechanisms available to all mainland states are currently problematic for many of the Pacific Islands because of the issue of local island datums and lack of geodetic control. Each island has a different set of reference system problems (see Appendix B for the program to improve geodetic control).

In addition to the research needed to identify these problems, the Islands team will work with the National Geodetic Survey (NGS) to determine the parameters appropriate to each island.   Furthermore, there will be an effort to work with Environmental Systems Research Institute (ESRI®) and other commercial software vendors to implement georeferencing solutions. ESRI is a priority because this is the software that is being used by the island CZM partners. In addition, NGS is installing continually operating reference stations (CORS) on American Samoa and CNMI and updating the vertical control for Guam. These activities will identify highly accurate spatial reference points previously lacking in this area and enable accurate GIS positioning. The Center will work with NGS and ESRI to identify and develop mechanisms to enable the Island partners to utilize the appropriate datums and projections for their islands.

Develop training plan, including GIS, GPS, metadata, and remote sensing.

A major hurdle in implementing GIS is maintaining well-trained GIS staff. Training must address multiple issues. To ensure that CZM staff within the Islands can use the hardware and software, GIS and related technology training will be provided to staff from each island. These training opportunities will be geared to meet the needs of the individual islands, and may include GPS, metadata creation (compliant with Federal Geographic Data Committee, or FGDC, standards), projection and datum transformations, intermediate ArcView® GIS, and remote sensing. The Center has ESRI-authorized instructors to train staff members in ArcView. In addition, the Center has developed specialized GPS, metadata, remote sensing, and basic ArcView training for coastal programs. The Center may partner with NGS on advanced training for geodetic control and with ESRI for advanced GIS training.

Training and capacity building will also be a large component of the assistant's responsibilities. The assistant will help assess training needs and develop a long-term training plan for the island program.

Data are one of the most expensive elements of any GIS project, so strategies for increasing the longevity and integrity of data are considered important to the long-term success of this project. Well-documented data have a much higher value and longevity than those that are not. Moreover, all federal agencies and entities accepting federal funds are required by Executive Order 12906 to document spatial data using the FGDC metadata standard and make both metadata and data available. As such, a necessary step is training the Island technical staffs in the development of FGDC-compliant metadata and developing mechanisms and applications that facilitate good metadata creation. The Center will explore the feasibility of conducting local (on-island) metadata training.

During the Islands GIS project training in September, additional training will include basic and intermediate GIS classes; introduction to remote sensing; GPS, hardware, and metadata workshops; projections and datums overview; and project planning. In addition to technical training, there will be training to help the assistants acclimate into the unique cultures of the Pacific Islands. A guest instructor will teach a one-day session on possible cross-cultural issues. Further training opportunities will be identified or developed for future years (See Appendix A for training agenda).

Assist in securing appropriate software and hardware to ensure that the islands have appropriate resources to fulfill GIS needs.

The appropriate hardware and software configuration is an important element of a successful

implementation of GIS. The system will include the following to maximize the potential GIS use and long-term sustainability of the system: Pentium class Microsoft® Windows® workstation with all associated hardware and software elements, ESRI ArcGIS® software, including ArcView and extensions, Arc Info 8.1®, and Spatial Analyst® for Arc Info 8.1. ESRI products were selected for this project for a number of reasons. As documented in the 1999 *Coastal Resource Management Customer Survey*, ESRI software is the GIS software most commonly used by the CZM community. In addition, some installations of these ESRI products were already in use by the Island CZM partners and their networked agencies. Each system will include power backup units to ensure controlled shutdown of systems during the frequent (on some islands) power outages. Tape backup units and easy-to-use procedures for backups will be included to encourage contingency planning for potential computer failures. Large format desktop printers will also be provided with the systems, and some computer supplies (e.g., tapes, ink cartridges) will be included to increase functionality. All computers will include network interface cards to support intranet and Internet access to the system.

In addition to the fundamental GIS software and hardware, GPS has become a standard for GIS users to accurately map field data. GPS receivers provide a mechanism to collect georeferenced data within management areas on a regular basis. Each system will include a name-brand GPS receiver and software that is integrated into the package. Currently, GPS use on some of the islands is limited because of problems with conversion between local datums and global reference frames. The improvement of the reference frame should facilitate the widespread use of GPS on all the islands.

The hardware and software will be purchased in the first year of the project and transferred to each island's CZM program. It is intended that the assistant will use the GIS workstation for the duration of his or her tenure. If feasible, a network connection between computers would allow for the GIS software to be shared with the island GIS staff. Operationally, NOAA will still own the computer systems. Inventory control documents will be developed at the Center and transferred to the OCRM for long-term inventory tracking. The computers will be shipped to the individual island partner and scheduled to arrive close to the arrival time of the Islands GIS assistant.

Access to the Internet is considered necessary for the support and integration of the GIS. Where necessary, improved Internet access will be explored to identify the most cost-effective, high-speed connection available for the systems on the island. It is planned that basic office support, as well as desk, chair, phone, space, etc. will be incurred by the individual Island partners.

Develop an implementation strategy for data development and provide assistance in finding, acquiring, and integrating spatial data.

Usable and well-documented data are a critical element of any successful GIS program. High-quality data are generally the most expensive component of any GIS, but offer the greatest opportunity to leverage partnerships. Because funds for new data acquisition will be limited, every effort will be made to develop data-sharing mechanisms. Data priorities vary between the islands, but a few data needs are fundamental. Foremost, each island must have adequate geodetic control and known variables about its reference system. Geodetic control is the base data layer that ties all of the other data to a known location on the surface of the Earth (see Appendix B for the program to improve geodetic control).

Each island has the need for a high-resolution imagery layer. This layer will provide a base from which to collect and portray other data elements and can be used for additional research purposes. Other than Hawaii, aerial surveys of the islands are problematic because of limited access to suitable aircraft. A new satellite imagery source, which is expected to meet most of the programmatic needs, is the IKONOS imagery from Space Imaging, Inc. Both 1-meter panchromatic and the 4-meter multi-spectral data are useful for CZM applications. The 1-meter and 4-meter images approximate a 1:3,600 and 1:14,300 photogrammetric product. Roads, buildings, ponds, rivers, and golf courses are some of the features that can be identified using the 1-meter data. The islands can use the imagery to create baseline information such as roads, village boundaries, and building identification. These data can aid land use, utility, and telecommunications planning. The 4-meter data can be used for concurrent coral reef mapping efforts,

and might also be used by the CZM agencies to leverage access to additional data sets that reside with other government or private agencies but that are currently unavailable for CZM use. OCRM facilitated the acquisition of funds and the Center worked with the NOAA Special Projects Office to specify and order IKONOS imagery to cover Guam, CNMI, and American Samoa. We are exploring options for acquiring imagery for Hawaii (TBD). This IKONOS imagery was specified to meet the requirements of the CZM programs, as well as the future needs of the coral mapping effort. In addition, all licensing agreements with Space Imaging were specified to include territorial and commonwealth governments of Guam, American Samoa, and CNMI to ensure access to the imagery by the local partners.

The Center will work with each individual island to develop a priority data list. The Center will help the islands convert data where possible and look for licensing mechanisms to increase access. The assistant, the individual islands, the PSC, OCRM, and the Center will all look for data acquisition sharing opportunities. Where possible, data collection efforts will be leveraged with funds from multiple sources and work to address multiple agency needs. Because of the expense, this project must be opportunistic and make the best use of the limited data development funds. Individual data conversion needs, such as the conversion of analog maps to digital, will be addressed as they arise based on the resources available.

Develop a hardware/software support strategy.

Technical support is required for GIS hardware and software in order to minimize system downtime and maximize performance and efficiency. Where possible, all equipment and software will be purchased with maintenance and technical support contracts. In many cases, the support contract will cover three years, but in some cases it may be less; this will be specified in the support list. A technical support contacts list will be included with each GIS system for easy reference. There will need to be a phased approach to address how long-term maintenance and support will covered. It is expected that at some future date, the individual islands CZM programs will takeover technical support and maintenance contracts.

Develop communication networks that support data and knowledge sharing and access.

Currently, there is a limited network of technical GIS expertise on many of the islands. Therefore, having outside GIS expertise available is essential for the successful development and implementation of GIS. In addition to the assistantship program, technical support may be provided through an Internet Web page and a listserver, if deemed useful by the Island project participants. The Center, with support from the PSC, will create these mechanisms and keep them up-to-date until the Island partners are able to maintain them on their own. Telephone, e-mail, and site visits to facilitate technical support will also be implemented.

A Pacific Islands Web site is being developed for internal use of the partners, and an external site will be developed to showcase the progress of the project.

Detailed Overview

Although there are similarities among islands needs and issues, it is important to note that there are core differences in the staging of GIS within each coastal program, different institutional arrangements, and unique perspectives on the role and needs for the project. To be successful, each island's needs must be examined individually and the project components tailored to these specific needs. The needs assessments and site visits conducted for each island identified individual strengths and weaknesses in institutional spatial technological capacity. After reviewing these needs assessments, and with input from the Island partners, the following plans were developed to increase the capacity of their CZM GIS departments.

American Samoa

Current Capacity

American Samoa currently has GIS capacity both within the Coastal Management Program (CMP) and their parent agency, the Department of Commerce (DOC). The Office of Planning, also under DOC, has a GIS manager and technician on staff. The CMP currently has a program coordinator who has experience in ArcView GIS. The CMP would like to increase GIS capacity through data development, application building, and by training local agencies in GIS technology.

In addition to the GIS capacity within the DOC offices, there is new capacity for ArcView training at the community college. The local GIS users' group has been revitalized and comprises a broad representation of territorial, federal, and community college members. There are also a number of federal efforts focusing on the region. The Center, through the Islands GIS project, will work to coordinate with these efforts as much as possible.

The following specific objectives will be the focus of building GIS capacity within American Samoa's coastal program.

1) Implement assistantship program
   a) Assist in position description for assistantship, and participate in interview process and selection of candidate
   b) Provide initial technical training and introduction to the project goals and objectives to the selected assistant and support ongoing training and technical needs
   c) Help assistant & CMP focus and develop realistic project plan for duration of assistantship.
2) Resolve geodetic control issues and transformation algorithms
   a) Coordinate with NGS for CORS installation
   b) Hold geodetic control workshop
   c) Provide training on datums, transformations, and transformation applications.
3) Purchase hardware, software, supplies, and support contracts
4) Investigate spatial data resources, data sharing, and applications
   a) Coordinate acquisition of IKONOS satellite imagery and acquire images for American Samoa
   b) Scan Coastal Atlas to support efforts to incorporate atlas maps into GIS
   c) Investigate other sources of data including bathymetry, photos, images, offshore and exclusive economic zone (EEZ) data, and GIS layers from sources such as coral reef mapping efforts and other federal, state, and local agencies
   d) Investigate development of multi-agency data sharing mechanism (enterprise system, Web-based system with administrator, clearinghouse)

    e) Maintain updated Pacific Islands Web site and develop contact lists and calendar of environmental agency projects, activities, and conferences

    f) Host listserver for Pacific Islands GIS users

    g) Investigate permit-tracking system and georeferencing limitations (including communal boundaries in some islands).

5) Provide support with training and outreach activities

    a) Investigate training options through Center programs or other outside resources

    b) Investigate development of GIS lecture series (including metadata and datum) with community college and GIS users' group

    c) Provide training on outreach and coordination activities (GIS day material development, intra-island listserver maintenance).

Guam

Current Capacity

The Guam Coastal Management Program (GCMP) has a relatively long history and expertise with GIS. A recent change in GIS software has necessitated additional training and application development. The institutional arrangements between territorial agencies are generally positive and well developed. The GCMP is highly networked; activities are distributed throughout the various agencies. This complicates the implementation of GIS (or any information technology application) by adding multiple offices to integrate. The office equipment is fairly modern, the local- and wide-area networks (LAN and WAN) appear to be relatively stable, and there is some level of management information services (MIS) support within the government.

There is an informal GIS users' group on the island. Lately, this group has not been active, but there is interest in reconvening the group. There are connections with the University of Guam that might be leveraged, especially for on-island training. Additional staff with a strong technology and MIS background works in the office of the Superior Court in the judicial branch of government and is supporting GIS within the government.

The following specific objectives will be the focus of building GIS capacity within the Guam Coastal Management Program.

1) Implement assistantship program

    a) Assist in position description for assistantship, and participate in interview process and selection of candidate

    b) Provide initial technical training and introduction to the project goals and objectives to the selected assistant and support ongoing training and technical needs

    c) Help assistant & CMP focus and develop realistic project plan for duration of assistantship.

2) Resolve geodetic control issues and transformation algorithms

    a) Confirm and test that CORS on Guam is useable by CZM program

    b) Support NGS in their effort to "blue-book" existing geodetic survey data

    c) Work with NGS to confirm accuracy of transformations currently used by GUAM GIS community

    d) Ultimately work to have transformations installed in ESRI product line

    e) Support NGS in improvement of Guam vertical reference system.

3) Purchase hardware, software, supplies, and support contracts.

4) Investigate spatial data resources, data sharing, and applications

    a) Coordinate acquisition of IKONOS satellite imagery and use of images by Guam government

    b) Investigate other sources of data including bathymetry, photos, images, offshore and EEZ data, and GIS layers from sources such as coral reef mapping efforts and other federal, state, and local agencies

    c) Investigate development of multi-agency data sharing mechanism (enterprise system, Web-based system with administrator, clearinghouse)

    d) Maintain updated Pacific Islands Web site and develop calendar of contacts, environmental agency projects, activities, and conferences
    e) Host listserver for Pacific Islands GIS users
    f) Investigate permit-tracking system given current cadastral layers and georeferencing limitations
    g) Investigate AutoCAD to ArcView and Genesys-to-ArcView conversion issues.
5) Provide and support with training and outreach activities
    a) Investigate opportunities for training in ArcView, metadata development, and GPS on-site
    b) Investigate training through Center programs or other outside resources
    c) Investigate development of training opportunities (including metadata and datum) with the University of Guam and GIS user group
    d) Provide training on outreach and coordination activities (GIS day material development, intra-island listserver maintenance).

CNMI

Current Capacity

CNMI Coastal Resource Management (CRM) has some experience with using GIS and related mapping technologies. Considerable institutional knowledge left the program last year with the departure of their GIS staff person. Additional staff has been hired to assist with GIS within the office. In the main CRM office, one staff member is slated to work 50% on GIS. This person will serve as the mentor to the assistant. In addition, there are satellite CRM offices on Rota and Tinian. One of the staff members on Rota has been to CSC for training, and will be receiving GIS computer equipment as part of this effort. The Assistant will help to serve as a conduit between the two GIS systems. A digital Environmental Sensitivity Atlas and Watershed Atlas are available, but they do not have FGDC metadata files documenting the source of the data.

Staff access to computers and printers is limited, as is current LAN networking. Internet connectivity is shared and slow via a dialup through a local Internet service provider at 50 kilobytes per second maximum speed. Power outages have been common island-wide. These problems may be improving as additional resources are currently being installed.

The following specific objectives will be the focus of building GIS capacity within the CNMI's Coastal Resource Management program.

1) Implement assistantship program
    a) Assist in position description for assistantship, and participate in interview process and selection of candidate
    b) Provide initial technical training and introduction to the project goals and objectives to the selected assistant and support ongoing training and technical needs
    c) Help assistant & CZM program focus and develop realistic project plan for duration of assistantship.
2) Resolve geodetic control issues and transformation algorithms
    a) Coordinate with NGS for CORS installation
    b) Hold geodetic control workshop
    c) Provide training on datums, transformations, and transformation applications
    d) Work with NGS to investigate local datum and legal issues in order to modernize reference system in CNMI.
3) Purchase hardware, software, supplies, and support contracts
    a) Investigate methods for acquisition of survey-grade GPS for Department of Land Registration and Surveying
    b) Work with OCRM to support the improvement in office automation and improved computer systems.
4) Investigate spatial data resources, data sharing, and applications

     a) Coordinate acquisition of IKONOS satellite imagery and acquire images for Saipan, Tinian, and Rota (and outer uninhabited islands if possible)
     b) Investigate other sources of data including bathymetry, photos, images, offshore and EEZ data, and GIS layers from sources such as coral reef mapping efforts and other federal, state, and local agencies
     c) Investigate development of multi-agency data sharing mechanism (enterprise system, Web-based system with administrator, clearinghouse)
     d) Maintain updated Pacific Islands Web site and develop calendar of contacts, environmental agency projects, activities, and conferences
     e) Host listserver for Pacific Islands GIS users
     f) Investigate permit-tracking system and georeferencing limitations.
5) Provide and support with training and outreach activities
     a) Investigate opportunities for training in metadata development, ArcView, GPS on-site
     b) Investigate training through Center programs or other outside resources
     c) Investigate joint training opportunities with Guam
     d) Provide training on outreach and coordination activities (GIS day material development, intra-island listserver maintenance).

Hawaii

Current Capacity

Two primary agencies are responsible for CZM activities within the state of Hawaii. The Hawaii Coastal Zone Management (HI CZM) program is located within the Department of Planning and has a significant amount of GIS capability in its office. There are four staff members who work on GIS in the office and they have considerable expertise and work to serve all of the Hawaii State government. The Department of Land and Natural Resources (DLNR), which is the permitting and enforcement authority for Hawaii, has one GIS staff member and one set of software. The Assistant will be hosted and mentored by the HI CZM program. The integration of GIS activities between the CZM and DLNR offices is important to the effective use of GIS for resource management in Hawaii, and the assistant will act as a valuable link between the two offices. The primary needs of the Hawaii CZM program are marine data and base imagery for the islands.

There are other agencies and organizations on Hawaii with GIS capacity, including some of the counties, the University of Hawaii, the Pacific Disaster Center (PDC), and MEGIS (the Marine Environmental GIS, a GIS user group). PSC is located in Honolulu and will provide local support to the programs.

The following specific objectives will be the focus of building GIS capacity within Hawaii's coastal program.

1) Implement assistantship program
     a) Assist in position description for assistantship, and participate in interview process and selection of candidate
     b) Provide initial technical training and introduction to the project goals and objectives to the selected assistant and support ongoing training and technical needs
     c) Include DLNR in initial training and introduction
     d) Help assistant & CZM program focus and develop realistic project plan for duration of assistantship.
2) Resolve geodetic control issues and transformation algorithms
     a) Clarify Hawaii datum issues, including which datum is appropriate for state- and region-wide coordination
     b) Investigate transformation issues with Old Hawaii State Plan and incorporation into ESRI software
     c) Coordinate with NGS to provide training on datums, transformations, and transformation applications.

3) Purchase hardware, software, supplies, and support contracts
   a) Investigate additional avenues for purchase of hardware and software for extended CZM program needs.
4) Investigate spatial data resources, data sharing, and applications
   a) Investigate other sources of data including bathymetry, photos, images, offshore and EEZ data, and GIS layers from sources such as coral reef mapping efforts and other federal, state, and local agencies
   b) Coordinate with National Centers for Coastal Ocean Science to deliver imagery and derived data products to DLNR and ensure their usability
   c) Investigate availability of appropriate satellite imagery, DOQQs (digital orthoquad quarters) and historical data sets and applicability of aerial photos
   d) Investigate availability of road data-sharing with Department of Transportation
   e) Review Nature Conservancy data sets and applicability of data sharing
   f) Maintain updated Pacific Islands Web site and develop calendar of contacts, environmental agency projects, activities, and conferences
   g) Host listserver for Pacific Islands GIS users
   h) Identify tools available for CZM needs, including hazards, coral, emergency planning, and watershed management.
5) Provide and support with training and outreach activities
   a) Investigate opportunities for training in metadata development and GPS on-site
   b) Investigate training through Center programs (remote sensing) or other outside resources (Web-based mapping, and outreach)
   c) Include appropriate personnel in change shoreline workshop
   d) Investigate metadata workshops in conjunction with data clearinghouse issues
   e) Investigate advanced training for Web-based mapping
   f) Provide training on outreach and coordination activities (GIS day material development, intra-island listserver maintenance).

Participants and Roles

The success of the Islands GIS project will depend upon the involvement of a number of participants from many different organizations. The CZM programs are integral to this project in determining data and technology needs, and applications that are required as part of the day-to-day operations of their programs. The Center will conduct this project in partnership with the state, territorial, or commonwealth governments of American Samoa, Guam, CNMI, and Hawaii. As stated earlier, the CZM programs will need to provide mentoring staff to ensure the success of the assistants. Moreover, it is understood that the local hosts will provide office space, furniture, telecommunications, and other basic office support functions to the assistants.

The Center will lead the Pacific Islands GIS project. Center technical support staff within the Integration and Development (I&D) Program will be responsible for training, coordinating project meetings, creating assessment methodology, conducting research, purchasing equipment and data, and implementing the plan. Numerous groups within the Center will work together to make this project a success, including Information Resources, Coastal Learning Services, Coastal Remote Sensing Program, and the Outreach Program. Respectively, these Center groups will assist with metadata and Web services; training and workshop support; remote sensing, image processing training and support; and Island Assistant Program grant management and administration. Moreover, the Center's Administrative staff will provide procurement and computer support to the project.

The Island partners will work together with the Center to define the project goals and provide feedback for the project's components. Initially, the Center and the islands will work to select the appropriate assistant for each island according to individual program needs. The partners will review the proposed project methodology and make recommendations for improvements. They will identify further areas of interest for the project and will work together with the Center to develop their spatial analysis capabilities according to their island's needs. The islands will provide staff time to assist in the assessment process.

The PSC will also play an integral role in the Island GIS project, as the PSC is focused on the Pacific region. PSC will be coordinating and knowledgeable about a wide range of National Ocean Service and other Pacific activities and can assist in finding synergistic partnerships. Moreover, PSC technical staff will be better able to respond to technical support needs in a timely manner, as the working day in Hawaii more closely overlaps the islands' than that at the Center in South Carolina. Because of its proximity and mission, it is expected that PSC will assist in executing many of the Island region's training needs.

In addition, it is anticipated that NGS and OCRM will be cooperating partners. OCRM provides institutional knowledge of the politics, people, history of the Islands, and the CZM program and can help focus the technical efforts on programmatic goals. NGS provides technical expertise related to geodetic control, projections, and datums, and will be an essential resource in the development of digital data layers for the islands. Every effort will be made to coordinate elements of the project with OCRM, PSC, and NGS to ensure continuity between National Ocean Service activities.

Related Activities

There are a number of ongoing Center activities that will be leveraged to obtain the goals and objectives of this project.

Islands Assistantship Program

The Islands Assistantship program provides for a technical assistant to work within the Island region's CZM programs on GIS and related spatial technologies directed at protecting coastal and marine resources. Qualified individuals will have professional degrees and the ability to communicate effectively both orally and in writing with partners, agencies, villages, the public, and scientific/research communities. Tasks will include performing technical GIS work, conducting public outreach and education programs, and developing advanced GIS data and applications. Assistants will be employed for a period of two years through the Environmental Careers Organization (ECO) beginning in fiscal year 2002. This program is managed by CSC's Outreach Program with technical assistance from I&D and the PSC.

Protected Areas Geographic Information System

This project is intended to nest within larger programmatic goals of NOAA's National Ocean Service. The Center has recently completed year four of Protected Areas Geographic Information System (PAGIS), a project to build geospatial capacities in the national protected areas—specifically the National Estuarine Research Reserves (NERR) and National Marine Sanctuaries (NMS). Using the methodology and lessons learned from this project, Center technical staff, in close collaboration with Island staff, will develop an implementation plan that is most appropriate to the individual Pacific Islands. This project is managed within I&D.

Coastal Land Cover Mapping Activities

The Coastal Change Analysis Program (C-CAP) is assisting in mapping terrestrial landscapes and changes in the eight main Hawaiian Islands. The change interval will be determined by the availability of data. The mapping will be accomplished using Landsat Thematic Mapper imagery. This will be conducted in close coordination with the State of Hawaii and coastal resource agencies working in Hawaii. This program is managed within the Coastal Remote Sensing Program.

Pacific Services Center

Unique challenges of location and differences in time zones, cultures, and technical capabilities have complicated the delivery of services from the National Ocean Service to the Pacific Islands as compared to other coastal states. Thus, PSC has been established to better serve the region. PSC works in collaboration with existing NOAA programs in the Islands, including Pacific Islands GIS, Sea Grant, the National Weather Service, and the National Marine Fisheries Service. In addition, PSC will collaborate with other NOAA line offices, including OCRM, NGS, and the National Marine Sanctuaries. Through these collaborations, PSC will assist regional coastal managers by facilitating the exchange of coastal management information, and will be able to provide the specific information needs, technology, management, and training solutions for the region in the most effective and efficient manner.

Appendix A - Islands GIS Project Training Agenda

Tuesday Oct 2:   ***Program Introductions – Mentoring – GIS For Managers***

8:30–9 a.m.   Continental breakfast provided by ECO at the Center

9–10:30 a.m.   Introduction to the Center, Islands GIS Project, and week's agenda

10:30–10:45 a.m.   Break

10:45–11:15 a.m.   Mentoring Discussion

11:15 a.m.–Noon   ECO introduction and assistantship overview

Noon–1 p.m.   Lunch provided by ECO at the Center
                              Informal ECO discussion

1–2:30 p.m.   GIS for Managers
                              Note: this training will focus on specific coastal-related problems and how a GIS might be used to solve them to provide an overview for assistants. In this approach, you will use coastal spatial data to solve familiar problems that will be presented in scenarios.

2:30–2:45 p.m.   Break

2:45–4:45 p.m.   GIS for Managers (continued)

Wednesday Oct 3:   ***Projections & Datums – Global Positioning System (GPS)***

8:30–9 a.m.   Continental breakfast provided by ECO at the Center

9–10:30 a.m.   Overview of map projections and datums

10:30–10:45 a.m.   Break

10:45 a.m.–12:30 p.m.   Island-focused projections & datums discussion

12:30–2:30 p.m.   Lunch and Introduction to GPS and field mapping

2:30–4 p.m.   Field collection of data using GPS units

4–4:45 p.m.   Downloading GPS data

Thursday Oct 4:   ***Hardware and Software – Metadata Workshop –Intermediate GIS Training***

8:30–9 a.m.   Continental Breakfast provided by ECO at the Center

9–10:30 a.m.   Hardware and software workshop

10:30–10:45 a.m.	Break
10:45 a.m.–Noon	Metadata overview and training
Noon–1 p.m.	Lunch
1–2:30 p.m.	Intermediate GIS training – ArcView Extensions
2:30–2:45 p.m.	Break
2:45–5 p.m.	Intermediate GIS training- Examining Trends in Wetlands Restoration Introduction to Spatial Analyst

Friday Oct 5:   ***Remote Sensing – IKONOS – Metadata Training –***
                            Intermediate GIS Training

8:30–9 a.m.	Continental breakfast
9–10:15 a.m.	Introduction to Remote Sensing
10:15–10:30 a.m.	Break
10:30 a.m.–Noon	IKONOS and ArcView
Noon–1 p.m.	Lunch
1–2:30 p.m.	IKONOS Overview
2:30–2:45 p.m.	Break
2:45–4:30 p.m.	LIDAR overview

Saturday Oct 6 – Field Trip to Cypress Gardens
Cost: $7 per person. Box lunch will be provided by ECO.
Prices include boat ride, Butterfly House, and aquarium.

This 163-acre swamp garden was used as a freshwater reserve for Dean Hall, a huge Cooper River rice plantation, and was given to the city in 1963. Today, the giant cypress trees draped with Spanish moss provide an unforgettable setting for flat-bottom boats that glide among their knobby roots. Footpaths in the garden wind through a profusion of azaleas, camellias, daffodils, and other colorful blooms. Visitors share the swamp with alligators, pileated woodpeckers, wood ducks, otters, barred owls, and other abundant species.

Sunday Oct 7 – Free Day

Monday Oct 8: **Project Planning**

8:30–9 a.m.   Continental breakfast

9–10:15 a.m.   Project planning

10:15–10:30 a.m.   Break

10:30 a.m.–Noon   Project planning

Noon–1:00 p.m.   Lunch

1-2:30 p.m.   IKONOS Overview

2:30–3 p.m.   GIS Doctor Office

Tuesday Oct 9: **Intermediate GIS Training**

8:30–9 a.m.   Continental breakfast

9–10:15 a.m.   Intermediate GIS training –
                              Adding an Event Theme
                              Examining Trends in Water Quality

10:15–10:30 a.m.   Break

10:30 a.m.–Noon   Intermediate GIS training – Benthic Habitat Mapping

Noon– 1 p.m.   Lunch

1–2:30 p.m.   Intermediate GIS training (continue Benthic Habitat Mapping)

2:30–2:45 p.m.   Break

2:45–4:30 p.m.   Intermediate GIS training – Hazards

Wednesday Oct 10: **On-site cross-cultural training and career planning for Assistants**

8:30–9:00 a.m.   Continental breakfast

9–10:15 a.m.   Cross-cultural training

10:15–10:30 a.m.   Break

10:30 a.m.–Noon   Cross-cultural training

Noon–1 p.m.   Lunch provided by ECO at the Center

1– 4 p.m.   ECO guest speaker – Environmental Career Planning

Schedule at a Glance

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	Sept 30	Oct 1	Oct 2	Oct 3	Oct 4	Oct 5	Oct 6
a.m.	Travel and Arrival	Travel and Arrival	Introductory Meeting, Cultural Sensitivity Discussion	Projections and Datums with NGS	Hardware, Software & Metadata Workshop	Remote Sensing, IKONOS & Metadata Training	Field Trip to Cypress Gardens
Planned Lunchtime Events			Informal ECO Discussion	GPS Training			
p.m.			GIS for Managers	GPS Training and Field Collection	Intermediate GIS Training	Intermediate GIS Training	Field Trip to Cypress Gardens
Planned Evening Events			Southend Brewery or Andolini's Pizza Downtown	Middleton Plantation		BBQ at Cindy and Randy's	
	Oct 7	Oct 8	Oct 9	Oct 10	Oct 11	Oct 12	Oct 13
a.m.	Free Day	Project Planning	Intermediate GIS Training	Cultural Sensitivity Training (Assistants)	Departure		
Planned Lunchtime Events			Informal ESRI Product Discussion				
p.m.	Free Day	GIS Doctor Office	Intermediate GIS Training	ECO Guest Speaker			
Planned Evening Events		Happy Hour and Ghost Tour					

Appendix B – A Program for the Improvement of Local Geodetic Control Networks in American Samoa, Commonwealth of the Northern Marianas, and Guam

Program Objectives

This campaign is designed to improve the existing horizontal and vertical geodetic control networks on American Samoa, Commonwealth of the Northern Marianas (Rota, Saipan and Tinian) and Guam to ensure the spatial integrity of data collected with the GPS and maintained and accessed through GIS. Incorporated in this plan are the establishment of GPS CORS on American Samoa and Saipan, and the observation of a GPS High Accuracy Reference Network of existing geodetic vertical control points in all three areas. The observations will be performed by field units of the NGS who will also provide GPS observation and data reduction training to Federal and local government surveyors, and present seminars detailing the fundamentals of geodetic spatial reference systems, GPS and GIS to surveyors, program mangers, engineers and cartographers in American Samoa, Guam and CNMI.

Milestones

AMERICAN SAMOA

1. *August 6-10, 2001* Install CORS in Pago Pago
2. *August 6 - 20, 2001* Conduct reconnaissance and GPS survey on the islands of Tutuila and Tau
3. *August 6 - 20, 2001* Conduct a workshop for the surveyors and GIS users on using GPS data and datum transformations
4. *September - October 2001* Process, adjust and load all the data into the NGS Integrated Data Base
5. *September – October 2001* Determine the datum transformations for American Samoa.

GUAM and CNMI

1. *August 21- 25, 2001* Install CORS in Saipan
2. *August 21 - September 13, 2001* Conduct reconnaissance and GPS survey on the islands Guam, Saipan, Rota and Tinian
3. *August 21 - September 13, 2001* Conduct a workshop for the surveyors and GIS users on using GPS data and datum transformations
4. *September - November 2001* Process, adjust and load all the data into the NGS Integrated Data Base
5. *September – November 2001* Determine the datum transformations for Guam, Saipan, Rota, and Tinian.

Appendix C – Detailed Tasks for Fiscal Year 2001 and Fiscal Year 2002

Tasks for Year 1

Task 1	Assist in the Development of GIS Assistantship Job Descriptions
Activity	Develop draft job descriptions for the Islands and coordinate reviews with Islands point of contact. Review resumes and cover letters from applicants. Provide support to Islands in evaluating and choosing assistants.
Deliverable(s)	Assistantship job descriptions and selection
Date	September 28, 2001

Task 2	Conduct Needs Assessment in American Samoa, CNMI, Guam, and Hawaii
Activity	Visit with staff in the Islands' coastal programs and related organizations to gain a better understanding of GIS needs and applications.
Deliverable(s)	Detailed trip report
Date	May 30, 2001

Task 3	Develop Project Plan for Islands GIS
Activity	Incorporate findings from needs assessment trip into project plan for Islands GIS and conduct review of plan with Island partners. Complete operating plan for conducting work in fiscal year 2002.
Deliverable(s)	Yearly project plans
Date	September 28, 2001

Task 4	Determine Hardware and Software for the Islands
Activity	Identify appropriate hardware and software for the Islands, research prices, and investigate options for transferring the equipment to OCRM (for inventory purposes).
Deliverable(s)	Specifications and costs for hardware and software, equipment purchase
Date	July 31, 2001

Task 5	Develop Agenda for Islands Assistant/Project Lead Training Week
Activity	Determine agenda for the week-long training to be held at the Center to include basic and intermediate ArcView, metadata, remote sensing, GPS, and cultural awareness training and project overview. Coordinate trainers and dates.
Deliverable(s)	Agenda and date for training session
Date	July 15, 2001

Schedule for Year 1

TASK NUMBER	EVENT	START DATE	MILESTONE DATE	DELIVERABLE DATE
1	Assistantship job description	3/15/01	4/1/01	–
1	Assistants chosen	7/15/01	–	9/28/01
2	Draft trip report for Island review	5/14/01	5/23/01	–
2	Final trip report	5/14/01	–	5/30/01
3	Draft project plan for Island review	4/1/01	5/30/01	–
3	Project plan fiscal year 2001	4/1/01	6/30/01	–
3	Project plan fiscal year 2002	8/1/01	–	9/28/01
4	Specifications and costs for hardware and software	3/26/01	6/15/01	–
4	Purchase of equipment	6/15/01	–	7/31/01
5	Meeting with Coastal Management Services staff to identify agenda items for Islands training session	4/18/01	4/30/01	–
5	Final agenda for Islands training	4/18/01	–	7/15/01

Tasks for Year 2

Task 1	Assess Advanced Training Needs for Advanced GIS, Metadata and Remote Sensing
Activity	Develop report detailing advanced GIS training needs based on Pacific Services Center staff assessment and a list of private sector and university resources with feasibility of using their computer or instructor resources.
Deliverable(s)	A report detailing training needs, resource, and recommendations
Date	March 31, 2002

Task 2	Place Islands GIS Assistant in Islands
Activity	Place Assistant in CNMI, Guam, American Samoa, and Hawaii.
Deliverable(s)	Assistants hired and working in CZM program
Date	October 31, 2001

Task 3	Deliver On-site Islands Training
Activity	Based on results of training recommendations, implement on-site training as necessary. Also take advantage of trips to islands to conduct GIS, metadata, and remote sensing training.
Deliverable(s)	Training course determined from assessment of needs and resources
Date	September 30, 2002

Task 4	Investigate Usefulness of Base Map Data Resources
Activity	Develop a database of existing mapping activities in the Islands and spatial data resources, documenting the source, the date of the data, and its accessibility. Include LIDAR, corals, land cover, aerial photography, change analysis, and other historic data resources.
Deliverable(s)	Ongoing data distribution to Islands as applicable
Date	September 30, 2002

Task 5	Deliver IKONOS Data to Island Partners
Activity	Purchase and receive IKONOS data, and review. Work with metadata specialist to develop metadata for the data. Develop distribution plan to transfer to partner agencies. Develop a readme/user manual document to go along with the data, telling the users how to view it in ArcView. Hold special session at Islands meeting on how to use data.
Deliverable(s)	IKONOS Data on CD-ROM and user manual
Date	September 30, 2002

Task 6	Finalize Reference Frame for the Islands
Activity	Work with NGS to organize and train Island project leads and assistants. Finalize reference frame for the islands and ensure transformation parameters are available in commercial GIS software
Deliverable(s)	Datum training session completed and tool development recommendation
Date	March 29, 2002

Task 7	Develop a Pacific Mapping Activities Web Site
Activity	Determine appropriate components of an Islands GIS project Web site, decide where the site should be housed, and develop in coordination with Island partners, PSC, and assistants. Implement a listserver to facilitate communication among the project participants.
Deliverable(s)	Islands GIS Web site and listserver.
Date	December 31, 2001

Task 8	Monitor Progress of Assistants and Provide Technical Support
Activity	Provide training to all assistants on basic GIS skills. Work with assistants to develop project plans for 2-year assistantship. Host a meeting at the Center/PSC/ESRI to evaluate progress and provide additional training as requested.
Deliverable(s)	Quarterly reports detailing progress of assistants, report detailing training session at the Center
Date	December 31, 2002

Task 9	Maintain Communication with Islands GIS Partners
Activity	Investigate leveraging opportunities (e.g., ESRI conference and other Islands meetings) to develop further relationships with partners and conduct ongoing needs assessments and evaluations of project progress. Maintain communication through conferences, trips, Web page, and listserver.
Deliverable(s)	Detailed trip reports from relevant conferences and meetings.
Date	December 31, 2002

Task 10	Research Management Issues for Custom Application Development
Activity	Research management issues specific to the islands for year 3 GIS custom application development.
Deliverable(s)	Report detailing customized application development
Date	December 31, 2002

Schedule for Year 2

TASK NUMBER	EVENT	START DATE	MILESTONE DATE	DELIVERABLE DATE
1	A report detailing training needs, resources, and recommendations	9/1/01	3/31/02	–
1	Training course determined from assessment of needs and resources	3/31/02	–	6/28/02
2	Assistants on islands	7/15/01	–	10/31/01
3	Training session completed	9/1//01		9/30/02
4	Ongoing data distribution to the Islands	1/1/02	–	9/30/02
5	IKONOS data on CD-ROM and user manual	9/1/01	–	9/30/02
6	Projection and datums training session completed	9/1//01	9/30/01	–
6	Transformation parameters available in GIS software	9/1/01	–	3/29/02
7	GIS Web site and listserver	9/1/01	–	12/31/02
8	Quarterly progress reports	1/1/02	–	12/31/02
9	Trip reports from meetings and conferences	9/1/01	–	12/31/02
10	Report detailing custom application development	9/1/01	–	12/31/02

Appendix D – Project Staff Directory

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